



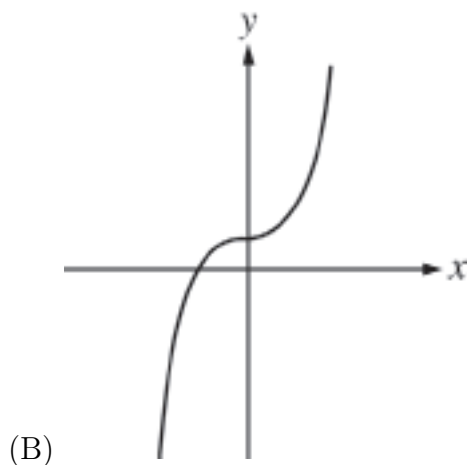
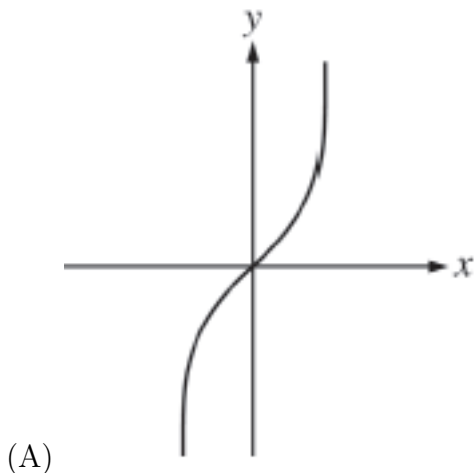
GRE math study group
Analysis examples
D Joyce, Fall 2011

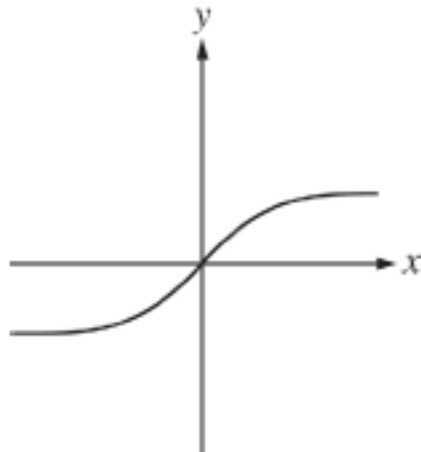
Analysis is a major topic covered by the GRE test in mathematics. Approximately 50 percent of the questions involve calculus and its applications. Material learned in the usual sequence of elementary calculus courses—differential and integral calculus of one and of several variables—includes calculus-based applications and connections with coordinate geometry, trigonometry, differential equations and other branches of mathematics. Here are some questions from the sample test from “higher calculus”.

26. Let $f(x, y) = x^2 - 2xy + y^3$ for all real x and y . Which of the following is true?

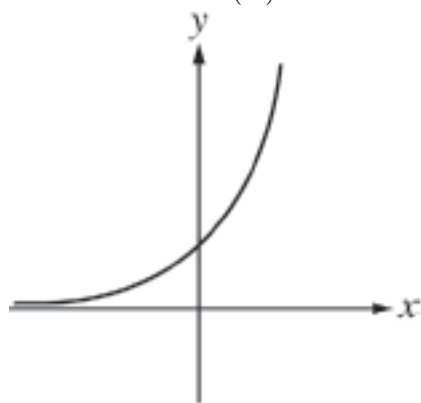
- (A) f has all of its relative extrema on the line $x = y$.
 - (B) f has all of its relative extrema on the parabola $x = y^2$.
 - (C) f has a relative minimum at $(0, 0)$.
 - (D) f has an absolute minimum at $(\frac{2}{3}, \frac{2}{3})$.
 - (E) f has an absolute minimum at $(1, 1)$.
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31. Which of the following most closely represents the graph of the solution to the differential equation $\frac{dy}{dx} = 1 + y^4$?

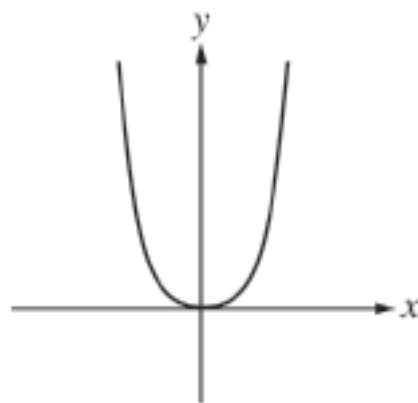




(C)



(D)



(E)

37. In the complex z -plane, the set of points satisfying the equation $z^2 = |z|^2$ is a

- (A) pair of points
- (B) circle
- (C) half-line
- (D) line
- (E) union of infinitely many different lines

41. Let C be the circle $x^2 + y^2 = 1$ oriented counterclockwise in the xy -plane. What is the value of the line integral $\oint_C (2x - y)dx + (x + 3y)dy$?

- (A) 0
- (B) 1
- (C) $\frac{\pi}{2}$
- (D) π
- (E) 2π

43. If $z = e^{2\pi i/5}$, then $1 + z + z^2 + z^3 + 5z^4 + 4z^5 + 4z^6 + 4z^7 + 4z^8 + 5z^9 =$

- (A) 0 (B) $4e^{3\pi i/5}$ (C) $5e^{4\pi i/5}$ (D) $-4e^{2\pi i/5}$ (E) $-5e^{3\pi i/5}$
-

47. Let F be a constant unit force that is parallel to the vector $(-1, 0, 1)$ in xyz -space. What is the work done by \mathbf{F} on a particle that moves along the path given by (t, t^2, t^3) between time $t = 0$ and time $t = 1$?

- (A) $-\frac{1}{4}$ (B) $-\frac{1}{4\sqrt{2}}$ (C) 0 (D) $\sqrt{2}$ (E) $3\sqrt{2}$
-

53. What is the minimum value of the expression $x + 4z$ as a function defined in \mathbf{R}^3 , subject to the constraint $x^2 + y^2 + z^2 \leq 2$?

- (A) 0 (B) -2 (C) $-\sqrt{34}$ (D) $-\sqrt{35}$ (E) $-5\sqrt{2}$
-

59. Suppose f is an analytic function of the complex variable $z = x + iy$ given by

$$f(z) = (2x + 3y) + ig(x, y),$$

where $g(x, y)$ is a real-valued function of the real variables x and y . If $f(2, 3) = 1$, then $g(7, 3) =$

- (A) -14 (B) -9 (C) 0 (D) 11 (E) 18
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GREmath Home Page at <http://math.clarku.edu/~djoyce/GREmath/>